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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/652,579	08/31/2000	Vishnu K. Agarwal	98-0616.13	4026
27076	7590	10/19/2004	EXAMINER	
DORSEY & WHITNEY LLP INTELLECTUAL PROPERTY DEPARTMENT SUITE 3400 1420 FIFTH AVENUE SEATTLE, WA 98101			EVERHART, CARIDAD	
			ART UNIT	PAPER NUMBER
			2825	

DATE MAILED: 10/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/652,579

**Applicant(s)**

AGARWAL, VISHNU K.

**Examiner**

Caridad M. Everhart

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 80-84 and 88-110 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 80-84 and 88-110 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_.

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***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 80 and 81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al. (US 6,010,931) in view of Lu (US 6,017,818)

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Sun, et al disclose the steps of forming an HSG layer, exposing the wafer in situ to an atmosphere for in situ doping of the HSG(col. 9, lines 15-25), depositing an upper electrode which may be tungsten or tungsten nitride(col. 6, lines 5-15). The exposure of the wafer to silane is also taught(col. 9, lines 19-21).

Sun, et al is silent with respect to the exposure of the tungsten nitride to diborane and with respect to the exposure to a reducing atmosphere.

Lu, et al teaches that the exposure of tungsten nitride improves that barrier layer of tungsten nitride(col. 3, lines 55-67 and claim 1; col. 4, lines 35-36 disclose that tungsten could be used instead of titanium as the refractory metal).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have applied the treatment taught by Lu, et al to the tungsten nitride taught by Sun, et al in order to improve the barrier qualities of the layer.

With respect to the exposure to the reducing atmosphere, it would have been obvious to one of ordinary skill in the art at the time of the invention that the exposure to a reducing atmosphere occurred during the in situ doping, as it is conventional in the art to perform the doping using phosphine or diborane, which form a reducing atmosphere.

Claims 82-84, and 88-110 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun, et al in view of Lu as applied to claim 80 above, and further in view of Yew et al (US 6,114,200).

Sun et al in view of Lu et al is silent with respect to a third layer.

Yew et al teaches a doped HSG layer, a TiN layer and a Ti layer or a polysilicon layer and the formation of a borophosphosilicate glass layer(col. 2, lines 1-10 and col. 3, lines

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33-47). The formation of the polysilicon would satisfy the limitation of exposing the wafer to a reducing atmosphere after deposition of the first conductive layer, as it involves silane exposure.

It would have been obvious to one of ordinary skill in the art to have added a third layer in the method taught by Sun et al in view of Lu because Yew et al teaches a third layer and because Lu teaches a layer of tungsten over the tungsten nitride which is treated with diborane. Yew et al also teaches that the TiN layer can be substituted by tungsten nitride(col. 3, lines 27-32) and therefore one of ordinary skill in the art would have substituted the TiN/Ti layer taught by Yew et al with a tungsten nitride/ tungsten layer or with a polysilicon layer, as Yew et al teaches that polysilicon was known in the prior art for the layer (col. 2, lines 1-10).


It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the dielectric layer taught by Yew et al in the method taught by Sun et al in view of Lu because this material is conventional in the art in the formation of a DRAM device, as taught by Yew et al, as it appears in the description of the prior art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caridad M. Everhart whose telephone number is 571-272-1892. The examiner can normally be reached on Monday through Fridays 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
**CARIDAD EVERHART**  
**PRIMARY EXAMINER**

C. Everhart  
10-7-2004